

REMARKS

The Office Action dated April 19, 2007, has been received and carefully noted. The above amendments and the following remarks are being submitted as a full and complete response thereto.

Claims 1, 2, 4-6, and 8-15 are pending in this application. Claims 1, 2, 4-6, and 8-15 have been rejected. Claims 1, 12, and 13 are amended in this response. Support for the amendments may be found in the specification as originally filed, in particular at page 34, lines 5-7, and page 36, lines 9-12. Thus, Applicants believe that no new matter is added. Applicants respectfully request reconsideration and withdrawal of all rejections.

Rejection Under 35 U.S.C. §103

Claims 1, 2, 4, 5, 9-12, 14 and 15 are rejected under 35 U.S.C. §103(a) as being unpatentable over Nanaumi et al. (U.S. Patent Publication No. 2002/0155340 A1) ("Nanaumi") and further in view of Sompalli et al. (U.S. Patent No. 6,524,736) ("Sompalli"). Applicants respectfully traverse this rejection.

Claim 1, as amended, recites:

A process of manufacturing membrane-electrode assemblies, said process comprising forming an electrolyte membrane by a film casting method in which a solution of a proton conductive polymer in **a first organic solvent is flow cast** on a film-casting substrate to form a wet film, and the electrolyte membrane is obtained by **reducing an amount of residual solvent in the wet film**, wherein the electrolyte membrane contains residual solvent in an amount of 1 part by weight or less based on 100 parts by weight of the proton conductive polymer; **applying a second solvent** to at least one facing surface of an electrode substrate and the electrolyte membrane; and then pressure bonding said electrolyte membrane

with said electrode substrate to form a membrane-electrode assembly...(emphasis added).

Claim 12, as amended, recites:

A process of manufacturing membrane-electrode assemblies, said process comprising forming an electrolyte membrane by (a) producing a wet electrolyte membrane film by a film casting method in which a solution of a proton conductive polymer in a **first organic solvent is flow cast** on a film-casting substrate, and (b) **reducing an amount of residual solvent** in the wet electrolyte membrane film to form the electrolyte membrane; **applying a second solvent** to at least one facing surface of an electrode substrate and the electrolyte membrane; and then pressure bonding said electrolyte membrane with said electrode substrate to form a membrane-electrode assembly. (emphasis added)

Applicants respectfully submit that primary reference Nanaumi does not teach or suggest the features of independent claims 1 and 12. Nanaumi is directed to a membrane electrode assembly that includes a polymer electrolyte membrane and electrodes having catalytic layers bonded to both surfaces of the electrolyte membrane (paragraph [0010]). To form the polymer electrolyte membrane in Nanaumi, a solution of a polymer electrolyte in an organic solvent is applied to the catalytic layer of one electrode. When the concentration of the organic solvent remaining in the polymer electrolyte membrane becomes 5-20 wt%, the catalyst slurry for the other electrode is applied to the surface of the membrane (paragraphs [0700]-[0071]). As stated by the Examiner in the Office Action, Nanaumi does not teach the application of a second solvent to at least one facing surface of an electrode substrate and the electrolyte membrane, as recited in claims 1 and 12, as amended. Further, Nanaumi fails to teach that the concentration of the solvent be reduced to 1 part by weight or less based on 100 parts by weight of the proton conductive polymer, as recited in claim 1.

Secondary reference Sompalli does not cure the defects of primary reference Nanaumi. Sompalli is directed to forming electrodes and membrane electrode assemblies for use in fuel cells (Col. 2, lines 62-63). Specifically, Sompalli teaches a process that entails forming an electrode on a substrate by applying a catalyst slurry containing a solvent, which evaporates to form the electrode film. (Col. 6, lines 6-10.) Sompalli et al. discloses that the electrode is then applied to the membrane using a "decal" transfer process involving hot pressing, and the substrate is removed from the electrode after the membrane and electrode have bonded. (Col. 7, lines 41-66.) No solvent is applied to the membrane or the electrode as a step in the transfer process. Sompalli also fails to teach that the amount of solvent is reduced in a reducing step that is carried out before the electrolyte membrane is bonded to the electrodes, as recited in claims 1 and 12. In addition, Sompalli does not teach or suggest that the electrolyte membrane contains a limited amount of solvent in an amount of 1 part by weight or less, as recited in claim 1.

Nanaumi and Sompalli both fail to disclose any steps for applying a first organic solvent, reducing the amount of residual first organic solvent, and applying a second solvent, and then pressure bonding the electrolyte membrane with the electrode substrate. In addition, the Examiner has not provided a valid reason for combining Nanaumi and Sompalli to arrive at the presently-claimed invention, without the benefit of hindsight. Applicants submit that one skilled in the art having the disclosures of Nanaumi and Sompalli before him would not be motivated to modify their disclosures to arrive at the presently-claimed invention.

Thus, Applicants respectfully submit that independent claim 1, and claims 2, 4, 5, 9-12, 14 and 15, which depend therefrom, and claim 12 are not obvious over the proposed combination of Nanaumi and Sompalli. For at least the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1, 2, 4, 5, 9-12, 14 and 15 under 35 U.S.C. §103(a) over Nanaumi in view of Sompalli.

Claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nanaumi et al. (U.S. Patent Publication No. 2002/0155340 A1) ("Nanaumi") in view of in view of Sompalli et al. (U.S. Patent No. 6,524,736) ("Sompalli"), as applied to claim 4 above, and further in view of Yamakawa et al. (U.S. Publication No. 2003/0173547) "Yamakawa." Applicants respectfully traverse this rejection.

As discussed above, Applicants submit that claim 1, as amended, is not obvious over the combination of Nanaumi and Sompalli. Further, Yamakawa fails to cure the defects of Nanaumi and Sompalli. In particular, Yamakawa does not teach the process steps of applying a first organic solvent, reducing the amount of residual first organic solvent, applying a second solvent, and then pressure bonding the electrolyte membrane with the electrode substrate, as recited in claim 1, as amended.

Accordingly, Applicants respectfully submit that claim 1 and claim 6, which depends therefrom, are not obvious over the proposed combination of Nanaumi, Sompalli, and Yamakawa. For at least the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 6 under 35 U.S.C. §103(a) over Nanaumi in view of Sompalli, and further in view of Yamakawa.

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nanaumi et al. (U.S. Patent Publication No. 2002/0155340 A1) ("Nanaumi") in view of in view of Sompalli et al. (U.S. Patent No. 6,524,736) ("Sompalli"), and further in view of Sansone et al. (U.S. Patent No. 6,187,231) "Sansone." Applicants respectfully traverse this rejection.

As discussed above, Applicants submit that claim 1, as amended, is not obvious over the combination of Nanaumi and Sompalli. Further, Sansone fails to cure the defects of Nanaumi and Sompalli. In particular, Sansone does not teach the process steps of applying a first organic solvent, reducing the amount of residual first organic solvent, applying a second solvent, and then pressure bonding the electrolyte membrane with the electrode substrate, as recited in claim 1, as amended.

Accordingly, Applicants respectfully submit that claim 1 and claim 8, which depends therefrom, are not obvious over the proposed combination of Nanaumi, Sompalli, and Yamakawa. For at least the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 8 under 35 U.S.C. §103(a) over Nanaumi in view of Sompalli, and further in view of Yamakawa.

Claim 13 is rejected under 35 U.S.C. §103(a) as being unpatentable over Nanaumi et al. (U.S. Patent Publication No. 2002/0155340 A1) ("Nanaumi") in view of in view of Sompalli et al. (U.S. Patent No. 6,524,736) ("Sompalli"), and further in view of Sansone et al. (U.S. Patent No. 6,187,231) "Sansone." Applicants respectfully traverse this rejection.

Claim 13, as amended, recites:

A process of manufacturing membrane-electrode assemblies, said process comprising forming an electrolyte membrane by (a) producing a wet electrolyte membrane film by a film casting method in which a solution of a proton conductive polymer in **a first organic solvent is flow cast** on a film-casting substrate, (b) **reducing an amount of residual solvent in the wet electrolyte membrane film** by soaking in water, and (c) drying the soaked, wet electrolyte membrane film to form the electrolyte membrane; **applying a second solvent** to at least one facing surface of an electrode substrate and the electrolyte membrane; and then pressure bonding said electrolyte membrane with said electrode substrate to form a membrane-electrode assembly. (emphasis added)

As discussed above, Nanaumi and Sompalli both fail to disclose any steps for applying a first organic solvent, reducing the amount of residual first organic solvent, applying a second solvent, and then pressure bonding the electrolyte membrane with the electrode substrate. Further, Sansone fails to cure the defects of Nanaumi and Sompalli. In particular, Sansone does not teach the process steps of applying a first organic solvent, reducing the amount of residual first organic solvent by soaking in water, applying a second solvent, and then pressure bonding the electrolyte membrane with the electrode substrate, as recited in claim 13, as amended. In addition, the Examiner has not provided a valid reason or way for combining Nanaumi, Sompalli, and Sansone to arrive at the presently-claimed invention, without the benefit of hindsight.

Accordingly, Applicants respectfully submit that claim 13, as amended, is not obvious over the proposed combination of Nanaumi, Sompalli, and Sansone. For at least the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claim 13 under 35 U.S.C. §103(a) over Nanaumi in view of Sompalli, and further in view of Sansone.

CONCLUSION

Applicants respectfully submit that this application is in condition for allowance and such action is earnestly solicited. If the Examiner believes that anything further is desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below to schedule a personal or telephone interview to discuss any remaining issues.

In the event that this paper is not being timely filed, the Applicants respectfully petition for an appropriate additional extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to Counsel's Deposit Account Number 01-2300, referencing Docket Number 026035-00010.

Respectfully submitted,



Sushupta T. Sudarshan
Registration Number 60,021

Customer Number 004372
ARENT FOX LLP
1050 Connecticut Avenue, NW
Suite 400
Washington, DC 20036-5339
Telephone: 202-857-6000
Fax: 202-638-4810

STS:vmh

Enclosure: Petition for Extension of Time